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Diagnostic Value of Thyroid FNAC - a five years retrospective hospital based Study

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ABSTRACT

The thyroid gland is easily accessible to fine needle aspiration cytology due to its superficial location. FNAC of thyroid is firmly established as a first line diagnostic test for evaluation of goiter and the single most effective test for pre-operative diagnosis of a solitary thyroid nodule. A five years retrospective study of thyroid swelling by FNAC was carried out in the Department of Pathology, Gauhati Medical College, Guwahati with the aim to determine the cytological pattern of thyroid lesions, and assess the diagnostic value of FNAC as an initial diagnostic method in the investigation of thyroid swellings. Data were collected from the records of FNAC of thyroid lesions done in 5 years from February 2007 to January 2012. A total of 200 patients underwent FNAC of thyroid swellings out of which twenty cases were inadequate for opinion in and excluded from the study. Of these, 60 cases underwent thyroidectomy and histopathological examination of the specimens was performed. The histopathological findings of 60 cases that underwent surgery were non-neoplastic in 40(66.67%) cases and neoplastic in 20(33.33%) cases which comprised of papillary carcinoma (21.67 %), follicular adenoma (5.0%), one case of follicular carcinoma and medullary carcinoma each (1.67%). Colloid Goiter (55.0%) was the commonest among the non-neoplastic entity. Analysis of the results yielded a sensitivity of 0.07091(95% CI=0.5711-0.8239), specificity of 0.2000 (95%CI=0.005051-0.7165), positive predictive value of 0.9070 (95%CI=0.7788-0.9741), and negative predictive value of 0.05882 (95%CI=0.001488-0.2867), with a diagnostic accuracy of 92.0%. Due to its high accuracy, sensitivity and specificity, FNAC of thyroid swelling may be considered as a primary line of investigation of thyroid nodule and its management.

Key Words: Thyroid nodule, Colloid Goiter, Papillary carcinoma, Medullary carcinoma, Thyroidectomy.

Abbreviations:
FNAC - Fine needle aspiration cytology; SEER - Surveillance, Epidemiology & End Result; FNA - Fine needle aspiration

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1. INTRODUCTION

Fine needle aspiration cytology is a well recognized diagnostic procedure for investigation of any clinically palpable swelling. The most important purpose of fine needle aspiration cytology is to (1) to detect whether a tissue rather a cell is diseased or not; (2) if diseased, to detect the type of lesion e.g. Inflammatory versus neoplastic; (3) if neoplastic, to differentiate between benign and malignant neoplasm and to detect the intensity/degree of the lesion and (4) other associated finding. The thyroid gland is easily accessible to fine needle aspiration cytology due to its superficial location. Diverse pattern of diseases may occur in thyroid gland. The non neoplastic lesions of thyroid include Goiter, Dyshormonogenic goiter, thyroiditis, Hyperplastic nodule, and thyroglossal cyst. Follicular neoplasm, Hurthle cell neoplasm, papillary carcinoma, medullary carcinoma and anplastic carcinoma are included in the neoplastic entity of thyroid gland. Most of the lesion may present clinically as either diffuse enlargement of the gland itself or a solitary thyroid nodule. Thyroid nodule is one of the most common clinical presentations with an annual incidence being 4% of general population (Kini et al. 1999). The majority of them are benign (Kini, 1999). The assessment of a thyroid nodule clinically is done by considering its size, texture, nodularity, fixation and tenderness of the lesion. Use of FNAC in Thyroid swelling enjoys unmatched popularity as it is predominantly related to the cosmetic complication and technical difficulties of thyroid surgery and relatively small number of true neoplasms in patients with thyroid nodules (Hamburger, 1994). According to the recent report, thyroid cancer represents 3.6% of all new cancer cases in the U.S (SEER Stat Fact Sheets, 2013). FNAC of thyroid is firmly established as a first line diagnostic test for evaluation of goiter and the single most effective test for pre-operative diagnosis of a solitary thyroid nodule (Orell et al. 1996). FNAC of thyroid if combined with clinical judgment greatly reduces time, cost and unnecessary surgery. By using the well documented cytologic criteria, most diagnostic entities can easily be readily identified from the cytological smears. The sole purpose of FNAC is to detect or to rule out malignancy in a palpable thyroid nodule. If smears are adequate, a confident diagnosis of carcinoma especially papillary thyroid carcinoma may be ascertained easily. A five years retrospective study of thyroid swelling by FNAC was carried out with aim to determine the cytological pattern of thyroid lesions, and assess the diagnostic value of FNAC as an initial diagnostic method in the investigation of thyroid swellings.

2. MATERIALS & METHODS

A retrospective hospital-based study was conducted at Department of Pathology in a tertiary level hospital of Gauhati, India. Data were collected from the records of FNAC of thyroid lesions done in 5 years from February 2007 to January 2011. Patients with thyroid lesions who had undergone FNAC on out-patient and in-patient basis in the cytology section and those whose aspirates were adequate were included in the study. A total of 200 patients underwent FNAC of thyroid swellings in the cytopathology section of the Pathology Department of our institute within the study period. FNAC was inadequate for opinion in twenty cases and excluded from the study. FNAC results were then compared with the available histopathology results to find the diagnostic accuracy of FNAC. The specimens were collected with the help of a 22- or 23-gauge needle attached to a 20 cc airtight disposable syringe and negative pressure applied to aspirate adequate sample. The sample was obtained by to and fro motion. Samples were smeared onto a clean grease free glass slides, air dried and fixed in 95% methanol, along with one or two air-dried smears for May Grunwald Giemsa (MGG) stain. In cystic lesions, after aspiration of fluids, the lesion was again aspirated. The fluid was centrifuged and smears are made from sediment. Wet-fixed smears were stained with papanicoalou stain. The cytology results were categorized into four groups: inadequate, benign, indeterminate, and malignant. The biopsy specimens were received in 10% formalin, routinely processed and stained with H&E stain. The histopathology diagnosis was classified as non-neoplastic or neoplastic (Benign and malignant). Entire patients' data entry was carried out by using Microsoft office excel 2007. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of FNAC, relative to the final histological diagnoses were analyzed by adopting the statistical Software Graph Pad InStat.

3. RESULTS

Among the aspirates from 200 cases, 20 smears were inadequate to opine. Out of 180 adequate smears, 129 cases were diagnosed as benign lesion; 18 cases were suspicious and 33 cases were diagnosed as malignant lesion on FNAC. Among the 180 adequate cases, 135 were female patients, while 45 were males with a female to male ratio being 3:1. Age of the patients ranged from twelve to seventy-five years .The distribution of benign, suspicious, and malignant cases on cytology was as shown in Table 1. Colloid goiter was the most common non- neoplastic thyroid swelling and papillary thyroid carcinoma was the commonest malignant tumour detected among the study group. Of these, 60 cases underwent surgical intervention and histopathological examination of the specimens was performed. The histopathological findings of 60 cases that underwent surgery were non-neoplastic in 40 (66.67%) and neoplastic in 20(33.33%) cases. Neoplastic lesions comprised of papillary carcinoma (21.67 %) (Figure 1) follicular adenoma (5.0%),

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Table 1

The distribution of benign, suspicious, and malignant cases on cytology

Cytologic Category	Thyroid Pathology	Frequency (%)
Benign Lesion	Colloid Goiter	99(55.0%)
	Hyperplastic Nodule	18(10.0%)
	Cystic Lesion	06(3.3%)
	Thyroiditis	06 (3.3%)
Suspicious Lesion	Follicular Neoplasm	12 (6.7%)
	Hurthle cell Neoplasm	06(3.3%)
Malignant lesion	Papillary carcinoma	27(15.0%)
	Medullary carcinoma	03(1.7%)
	Anaplastic Carcinoma	03(1.7%)

Table 2

Comparison between Cytology & Histopathology of Thyroid Nodule N=60

Lesion	Pathology	Cytology	Histology	Remark
Non neoplastic Lesion (n=43)	Colloid Goiter	33	33	TN=39
	Hyperplastic Nodule	06	03	FN=4
	Cystic Lesion	02	01	TP=16
	Thyroiditis	02	03	FP=1
Neoplastic lesion (n=17)	Follicular Neoplasm	04	05	
	Hurthle cell Neoplasm	02	01	
	Papillary carcinoma	10	13	
	Medullary carcinoma	01	01	
	Total	60	60	

Foot Note: TP= True Positive, TN= True Negative, FN= False Negative, FP= False Positive

one case of follicular carcinoma and medullary carcinoma each (1.67%), (Figure 2). When the report of Fine needle aspiration cytology and histology of 60 cases of thyroid swelling is compared, histology confirmed 39 nonneoplastic lesion and 16 neoplastic lesion diagnosed on FNAC. The details were described in table 2. Diagnostic value of FNAC in this study was as follows: 16 cases were true positive while 39 cases were true negative. In this study one case of hashimoto thyroiditis was over diagnosed as Hurthle cell neoplasm (False Positive). Out of four cases of false negative cases, one was follicular adenoma which was under diagnosed as thyroid cyst and three cases of papillary carcinoma were misinterpreted as hyperplastic nodule on FNAC. Analysis of the results yielded a sensitivity of 0.07091(95% CI=0.5711-0.8239), specificity of 0.2000 (95%CI=0.005051-0.7165), positive predictive value of 0.9070 (95%CI=0.7788-0.9741), and negative predictive value of0.05882 (95%CI=0.001488-0.2867), with a diagnostic accuracy of 92.0%.

4. DISCUSSION

Fine needle aspiration cytology of the thyroid gland has drastically changed the management of patients with thyroid disease. FNAC is widely accepted as primary line of diagnostic procedure due to high degree of sensitivity, specificity, positive and negative predictive value in the preoperative assessment of thyroid nodules (Serna de la Saravia et al. 2006). Study by Likhar et al. (2013) showed the sensitivity, specificity, and diagnostic accuracy of FNAC in the diagnosis of nodular colloid goiter were 100%, 70%, and 77.78%, respectively. FNAC showed sensitivity, specificity, and diagnostic accuracy of 100% in the diagnosis of malignant lesions like papillary carcinoma as well as thyroglossal cyst and abscess (Likhar et al, 2013). The accuracy of the FNAC analysis approaches 95% in the differentiation of the benign nodules from the malignant nodules of the thyroid gland (Gharib, 1994). FNAC of the thyroid swellings is reported to have a sensitivity range of 65 - 98% and a specificity of 72 - 100% (Hamburger, 1994). A retrospective study on FNAC of thyroid lesions for a period of five years was carried out by Bagga and Mahajan, the result of which showed 96.2% diagnostic accuracy rate of FNAC with a sensitivity of 66%, and specificity of 100% (Bagga & Mahajan 2010). The present study showed similar result with accuracy rate of 92.0%. In the present study, 55 cases were found to be accurately diagnosed. Only 5 cases were not consistent with histopathological diagnosis. One case of papillary

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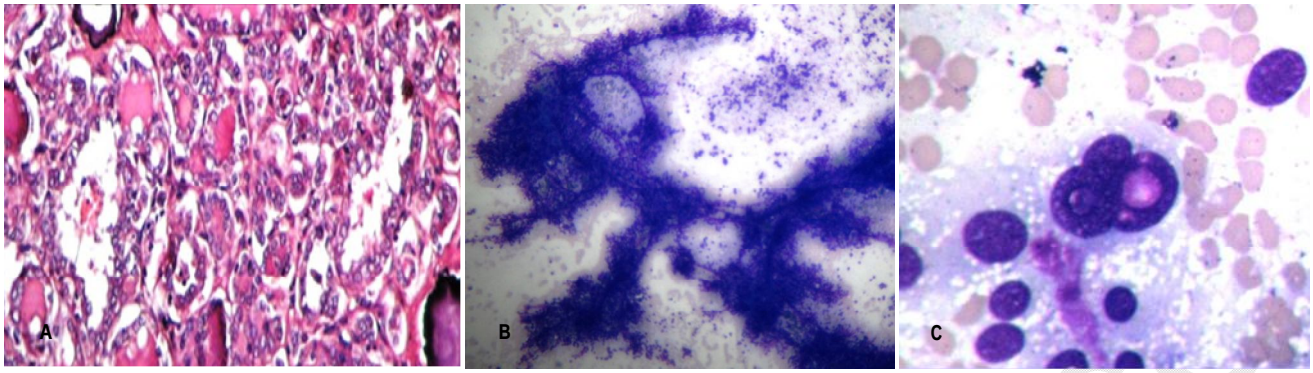

Figure 1

Papillary Carcinoma; (A) tissue change; (B) Papillae; (C) Intranuclear inclusion

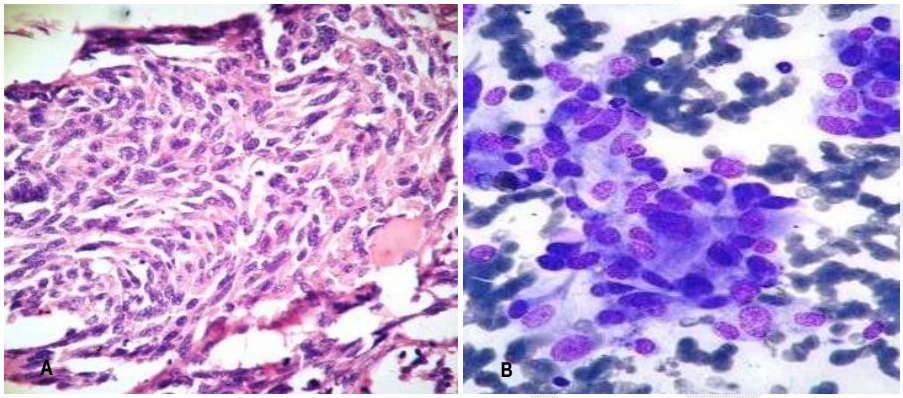

Figure 2

Medullary Carcinoma; (A) tissue change; (B) Spindle type of tumour cells FNAC

carcinoma was misdiagnosed as thyroid cyst due to aspiration of cystic content on FNA. The Lack of representative cellular element with papillae and absence of distinctive nuclear feature led to false negativity. Similarly two cases of papillary carcinoma were under diagnosed as hyperplastic nodule on cytology because of lack of representative material and absence of distinctive nuclear features in the cell aspirated. Other under diagnosed case of hyperplastic nodule was confirmed as follicular adenoma on histology. In this case the misinterpretation may be due aspiration of abundant colloid with mixture of few groups of follicular cells. One case of Hashimoto's thyroiditis was over diagnosed as Hurthle cell neoplasm possibly due to absence of lymphoplasmacytic cells in the smear. Diagnosis of medullary carcinoma can be safely offered by FNAC. In our study also, FNAC could diagnose medullary carcinoma which was later confirmed on histology. Sometimes, hemorrhagic aspirate also give trouble in identifying the morphological details of the cellular outline resulting in false negative or false positive diagnosis. Hence it may be said that apart from adequate cellular yield, experience and skill of the reporting cytopathologist is the most important criteria for consistency of the cytologic diagnosis. However diagnosing papillary carcinoma on FNAC is less problematic (Howlett et al. 2007). Our study also revealed 100% sensitivity in relation to papillary carcinoma. Difficulty arose in 3 cases which were initially diagnosed as hyperplastic nodule on FNAC. The aspirates of those cases showed benign follicular cells and cyst macrophages in an extensive hemorrhagic background. Hence the distinct nuclear features diagnostic of papillary carcinoma could not be appreciated.

5. CONCLUSION

Thyroid FNAC is now a well established, first line diagnostic tests for any thyroid swelling with the aim of confirming benign lesion, thereby, reducing unnecessary thyroid surgery. The success of FNAC depends on many factors like aspirator experience, skillful cytological interpretation and rational analysis based on cytological and clinical information in context of an individual patient. Hence it is the duty of every cytopathologist to get oriented to the utility and limitation of FNAC in thyroid lesions in order to offer a cheap, reliable, quick and correct diagnosis which will help immensely in the management of thyroid lesion.

SUMMARY OF RESEARCH

1.It is a hospital based retrospective study that describes the pattern of thyroid lesion that was encountered in this institute.
2.Due to its high accuracy, sensitivity and specificity, the present study establishes the value of FNAC of thyroid swelling as a primary line of investigation of thyroid nodule and its management.

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3.Limitation of this study was that due to absence of representative material 5 cases could not be diagnosed in the appropriate manner on FNAC. Out of 51 neoplastic lesions only 17 cases were available for histopathological study. The others could not be followed up. Probably these cases had been referred to the nearby regional cancer institute situated at Guwahati, India.

DISCLOSURE STATEMENT

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